

RESEARCH PROBLEM STATEMENT

Problem Title: Full-Depth Recycling and Stabilization of Pavement Base Layers

No.: 05.3-4

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1. Briefly describe the problem to be addressed:

The use of full-depth recycling (FDR) for reconstructing deteriorated asphalt pavements is advantageous from engineering, environmental, and economics perspectives. Last year UDOT utilized the FDR process in conjunction with cement stabilization to reconstruct Interstate 84 near Morgan. The project raised several questions about the design, construction, and performance of recycled, cement-stabilized layers. For example, what is the maximum permissible ratio of reclaimed asphalt pavement (RAP) to base? How is the optimum stabilizer type and content selected? How does one know when to open the stabilized layer to traffic? How does one quantify the benefit of stabilization with respect to both strength and durability? Research is needed to address these questions.

Strategic Goal: ☒ Preservation ☒ Operation ☐ Capacity ☐ Safety
(Check all that apply)

2. List the research objective(s) to be accomplished:

1. Evaluate the effects of different ratios of RAP to base on material strength, durability and density.
2. Evaluate the efficacy of specific types and amounts of different stabilizers for improving typical Utah materials.
3. Develop specifications regarding construction methods and early trafficking and curing issues.
4. Recommend procedures for designing recycled layers.
5. Address the challenge of measuring density in the field

3. List the major tasks required to accomplish the research objective(s): Estimated person-hours: 1500

1. Conduct a literature review to summarize existing work related to these topics.
2. Design and conduct laboratory and field experimentation.
 - a. Determine if target project subgrade is moisture susceptible and design appropriate stabilization process
 - b. Evaluate sensitivity of strength and durability to rap proportions and thickness of base.
 - c. Define QC requirements
3. Analyze data to formulate conclusions and recommendations.
 - a. Address minimum strength gain, curing issues, compaction time, time to paving, placement temperature, time to seal
4. Scope: Four or Five field projects (2 in R1, R3 and R4 potentials), materials from those projects used in lab

4. Outline the proposed schedule (when do you need this done, and how we will get there): (12 month proposed timeframe)

Because the other half of the Interstate 84 project in Morgan will be constructed this summer, this research should begin immediately if that project is to be considered for field experimentation. The literature review and experimentation could begin simultaneously. The former might require two to four months, while the field experimentation would depend on the availability of projects. Laboratory work would require eight to twelve months to complete, with the entire project leading to up to 18 months.

5. Indicate type of research and / or development project this is:

Large: ☒ Research Project ☒ Development Project
Small: ☐ Research Evaluation ☐ Experimental Feature ☐ New Product Evaluation ☐ Tech Transfer Initiative :
☐ Other _____

6. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)?

University and UDOT Staff

7. What deliverable(s) would you like to receive at the end of the project? (e.g. useable technical product, design method, technique, training, workshops, report, manual of practice, policy, procedure, specification, standard, software, hardware, equipment, training tool, etc.)

1. Report documenting effects of different ratios of RAP to base and efficacy of various stabilizers for improving typical Utah base materials
2. Comprehensive specifications for construction based on items identified in task list
3. Design procedures, including materials characteristics and parameters, for recycled, stabilized layers

8. Describe how this project will be implemented at UDOT.

UDOT engineers will use the data and specifications for designing and constructing high-quality, recycled, stabilized pavements.

9. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be.

Improving the design and construction of recycled, stabilized base layers will ultimately increase the service life of reconstructed pavements, reduce haul costs, effectively reuse existing materials, decrease pavement life-cycle costs, and provide the public with a better pavement.

10. Describe the expected risks, obstacles, and strategies to overcome these.

None

11. List the key UDOT Champion of this project (person who will help Research steer and lead this project, and will participate in implementation of the results): Nathan Lee, Pavement Management Engineer, 801-399-0351

12. Estimate the cost of this research study including implementation effort (use person-hours from No. 3):

13. List other champions (UDOT and non-UDOT) who are interested in and willing to participate in the Technical Advisory Committee for this study:

Name	Organization/Division/Region	Phone	Attended UTRAC?
A) Rodney Terry	UDOT Region 1 Materials Lab	801-399-0351	y
B) Bruce Vandre	UDOT State Office	801-965-4835	y
C) Todd Laker	Holcim Cement	801-643-2708	n
D) Mitzi McIntyre	ACPA	801-556-9561	y
E) Larry Gay	UDOT Region 4 Materials Lab	435-896-1306	y
F)			
G)			

14. Identify other Utah agencies, regional or national agencies, or other groups that may have an interest in supporting this study:

Portland Cement Association, Asphalt Zipper, Idaho DOT, Rocky Mountain Concrete Promotional Council